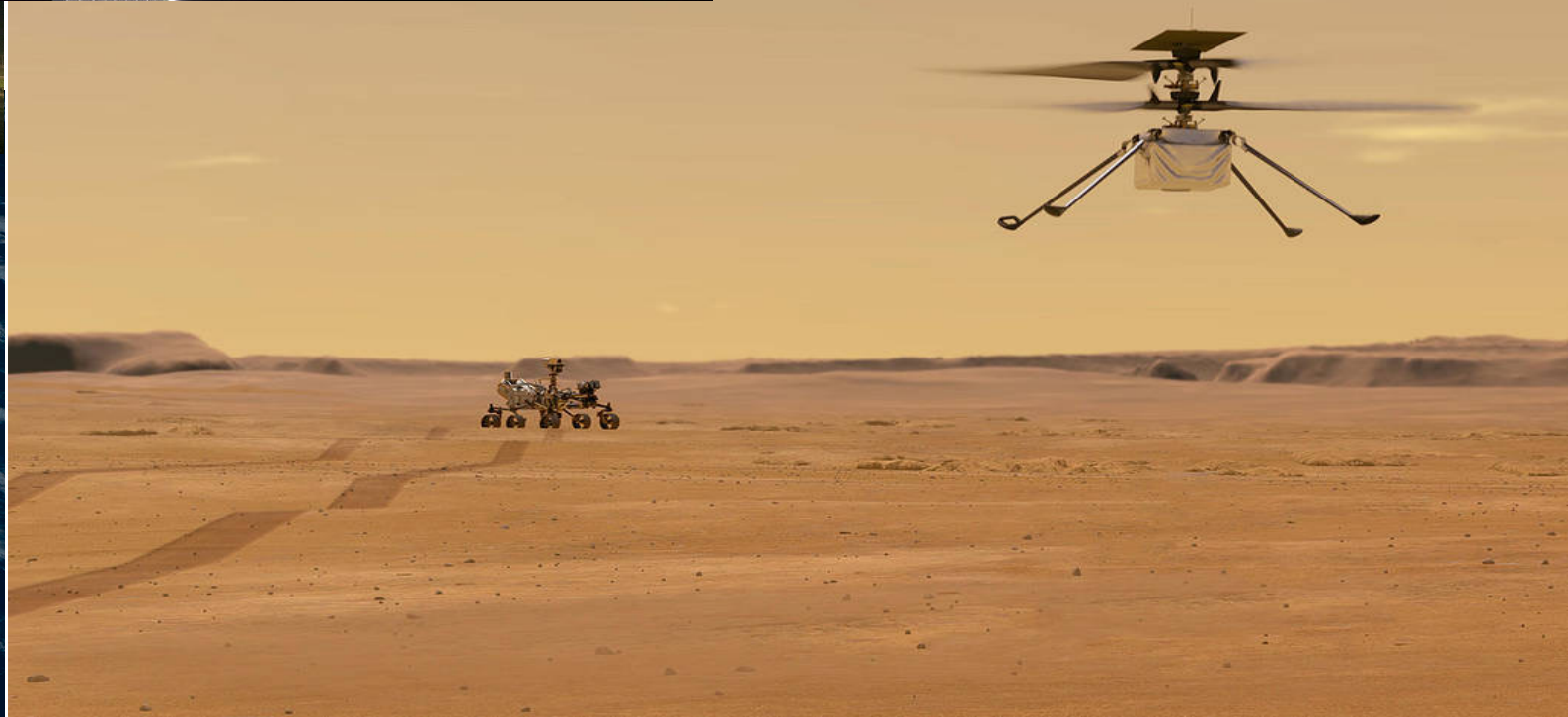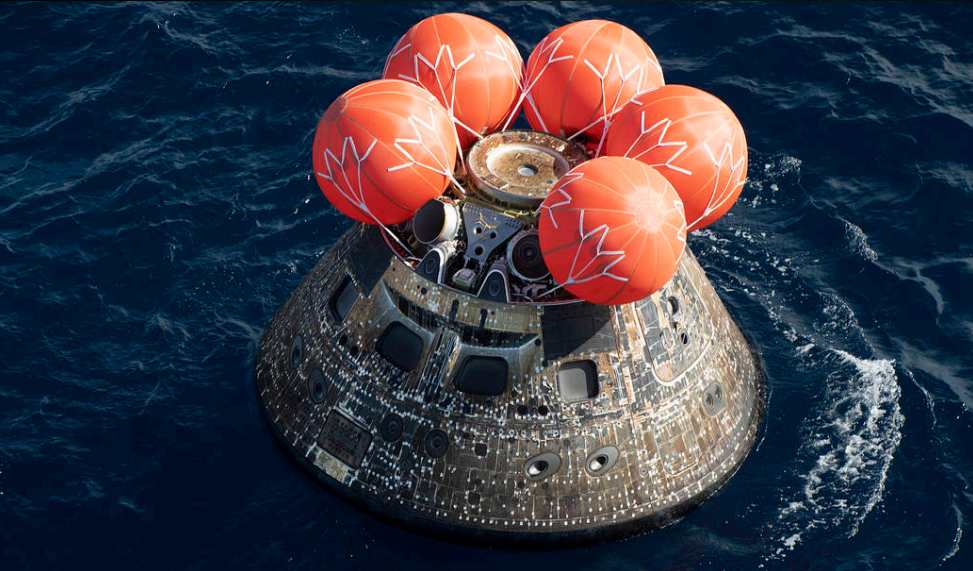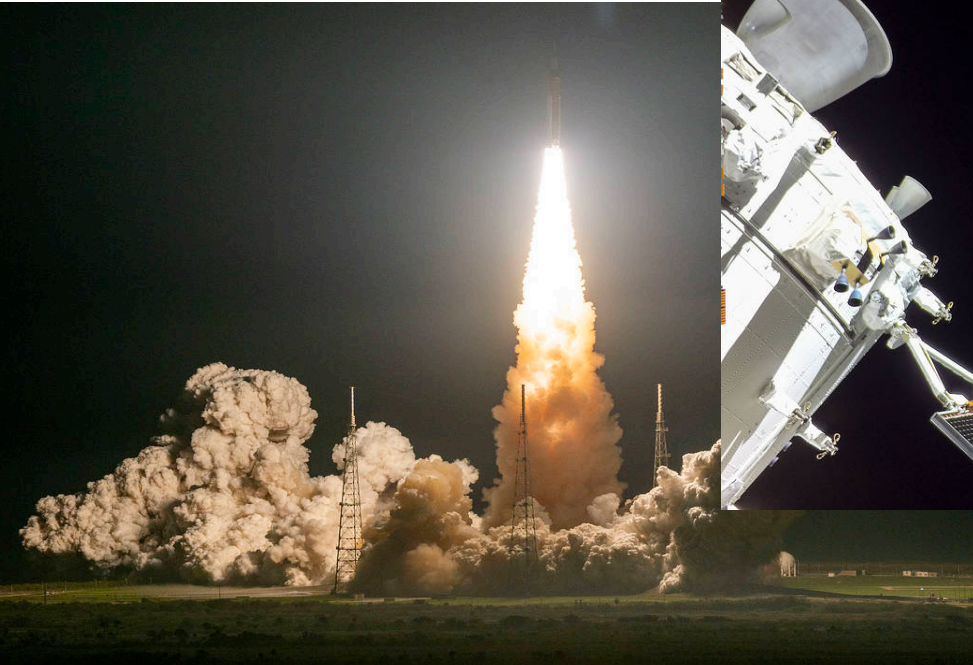"IGNITING YOUR FUTURE BY MAXIMIZING YOUR EARLY CAREER"

By Wes Ryan
Program Manager at NASA's
Aeronautics Research Institute
(NARI)

I V X

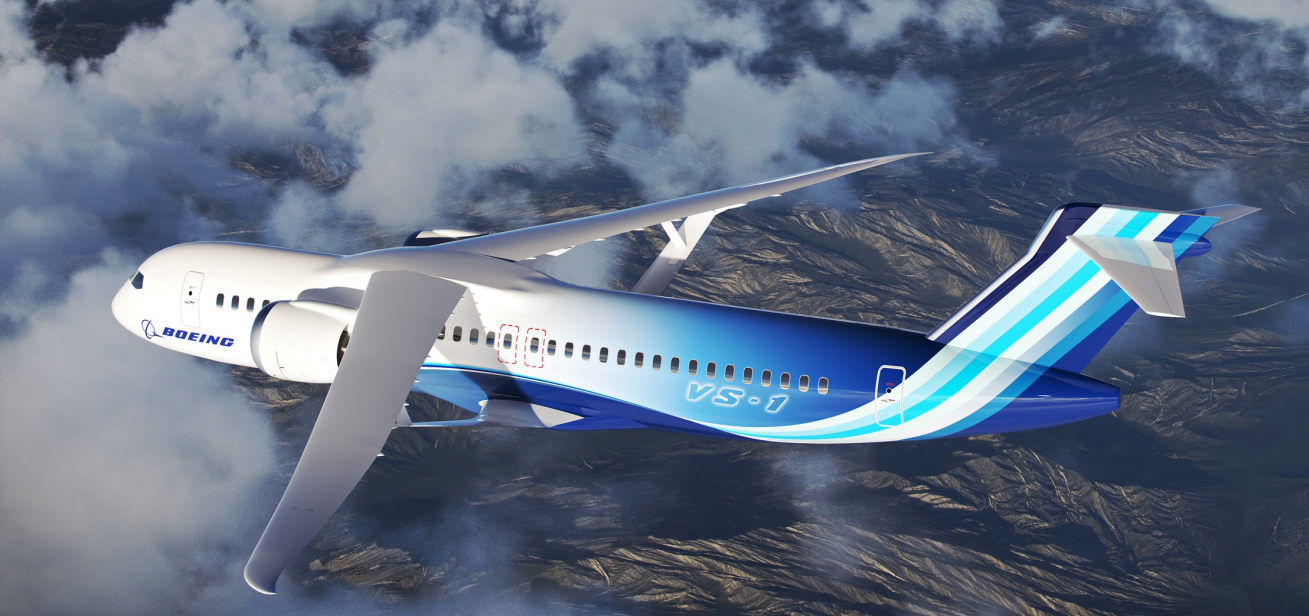IFAR VIRTUAL EXCHANGE
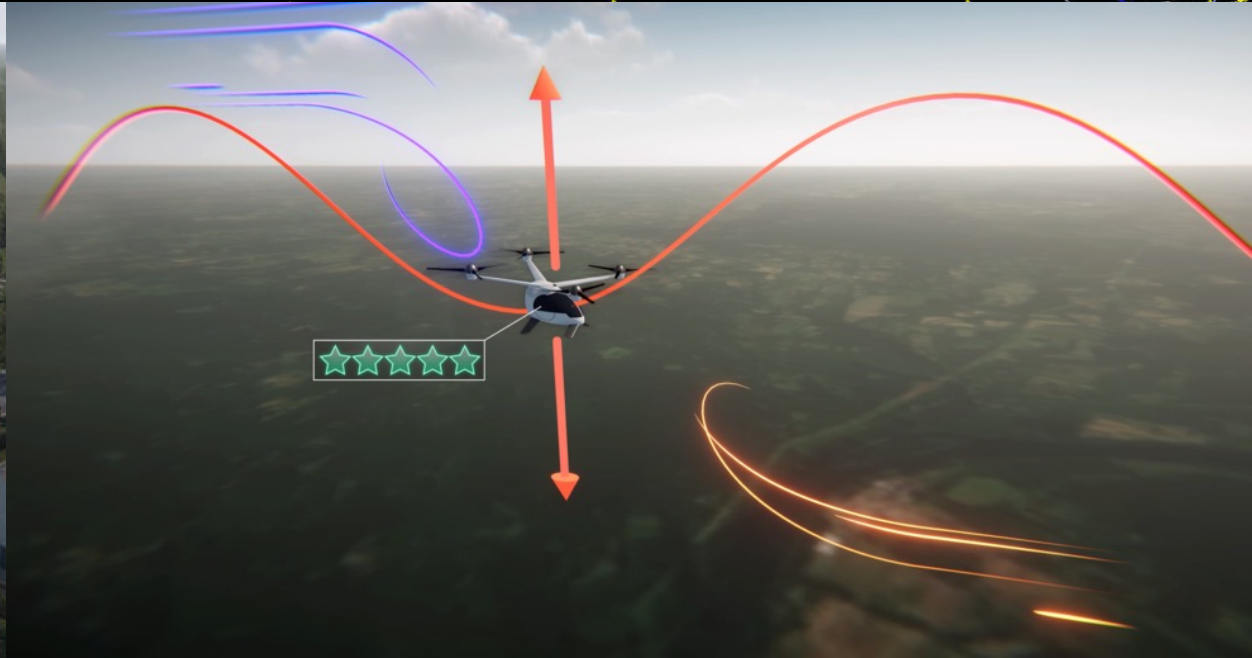
JANUARY 24TH, 2023 | **10:00 AM EST**

Space

Aeronautics

Airspace
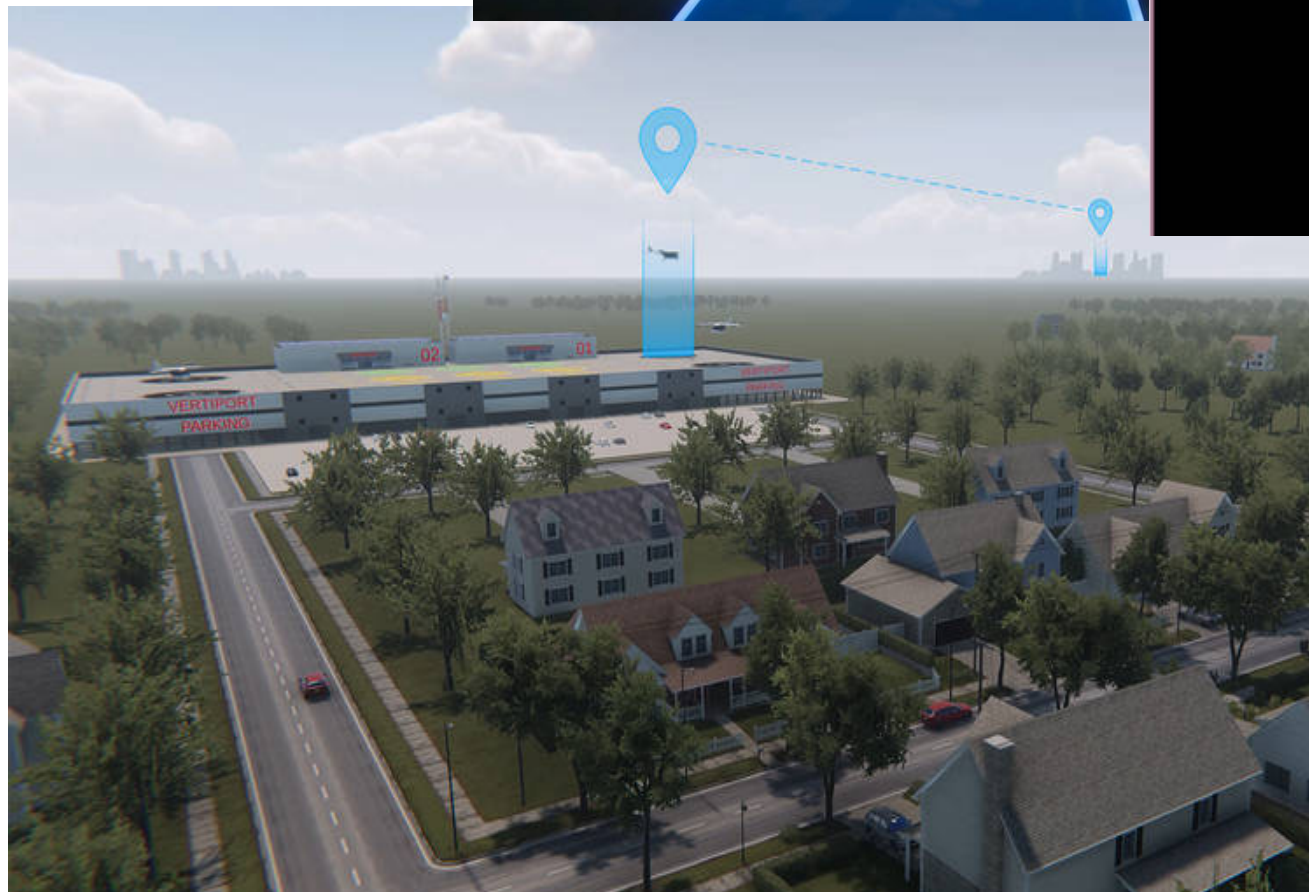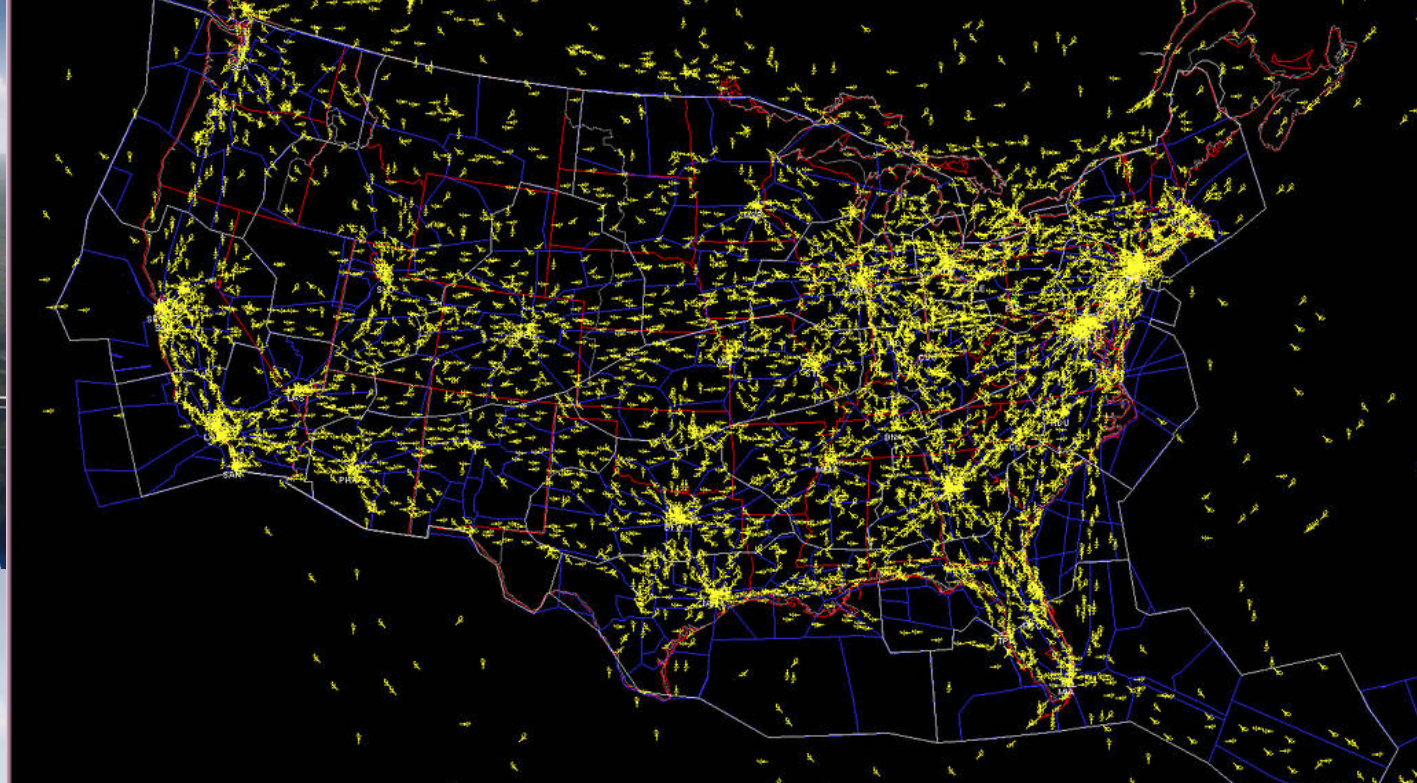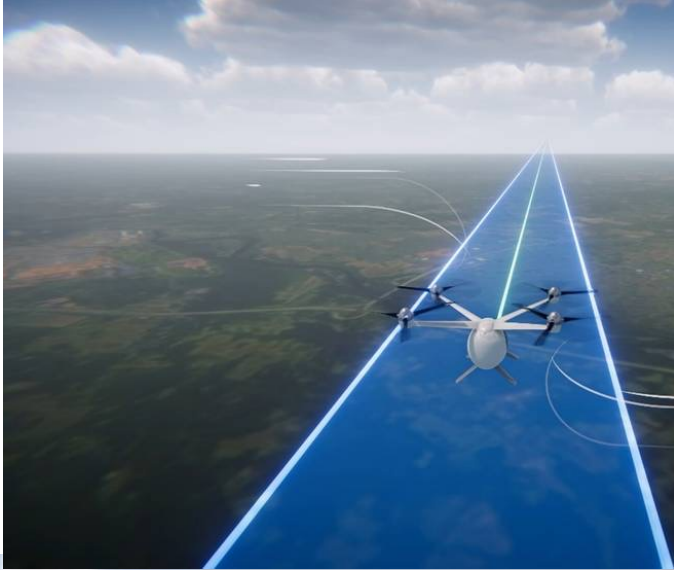
Automation

- How Can NASA Assist Industry/FAA to Bridge Gaps Between Future Vision for UAM/AAM and Current Capability?

- Industry Has Many, Independent Efforts, Different CONOPS, and Business Plans – Individually Working with FAA

- Seeking Common Approach to Define and Accelerate New Capabilities for Aircraft, Ops Integration, and Airspace Mgmt

Integrated Aviation Systems Program (IASP)

Transformative Aeronautics Concepts Program (TACP)

Advanced Air Vehicles Program (AAVP)

Airspace Operations and Safety Program (AOSP)

Ops Integration

Innovation & Technology Maturation

Aircraft

Airspace

Standards & Regulation

Building-in Robust Safety Assurance

- Compare Risk-based, Model Based Automation Development to Pilot/Crew Development Process
- How Do We Build In Proficiency, Robust Function?

Scenario–based Training With Instructor + Repetition + With Expected Outcomes/Behavior

Human

| Student Pilot | Private Pilot | Commercial Co-Pilot | Commercial Pilot |

Initial Aptitude and Skill
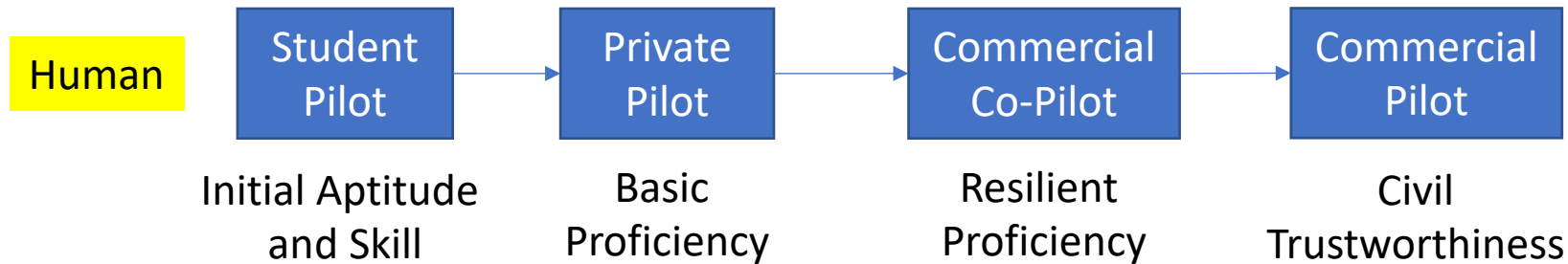
Basic Proficiency

Resilient Proficiency

Civil Trustworthiness

Simulation & Flight Test to Demonstrate Readiness for Intended Use, Type of Operation, Task Criticality

System

| Experimental Prototype | Advisory System | Assistive System | Safety Critical System |

Initial "Aptitude and Skill" in System Function

Proven Basic Proficiency

Proven Resilient Proficiency

Proven Civil Trustworthiness
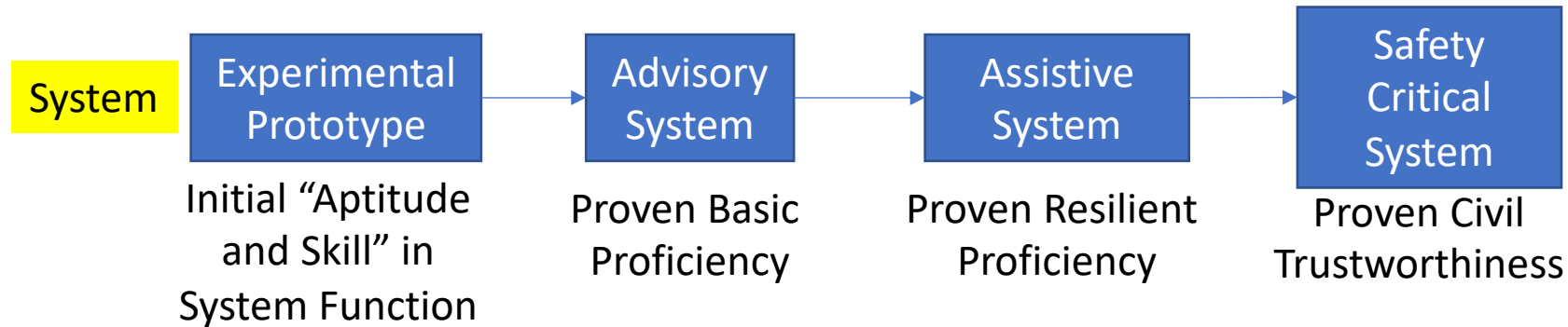
Must Work-up to Resilient/Robust Assurance in Automation Designs

Notional M:N Capability Maturity Model

Capability → Functions/Services → Technology → Data

- Capability – a new Ability, Level of Expertise, Level of Proficiency
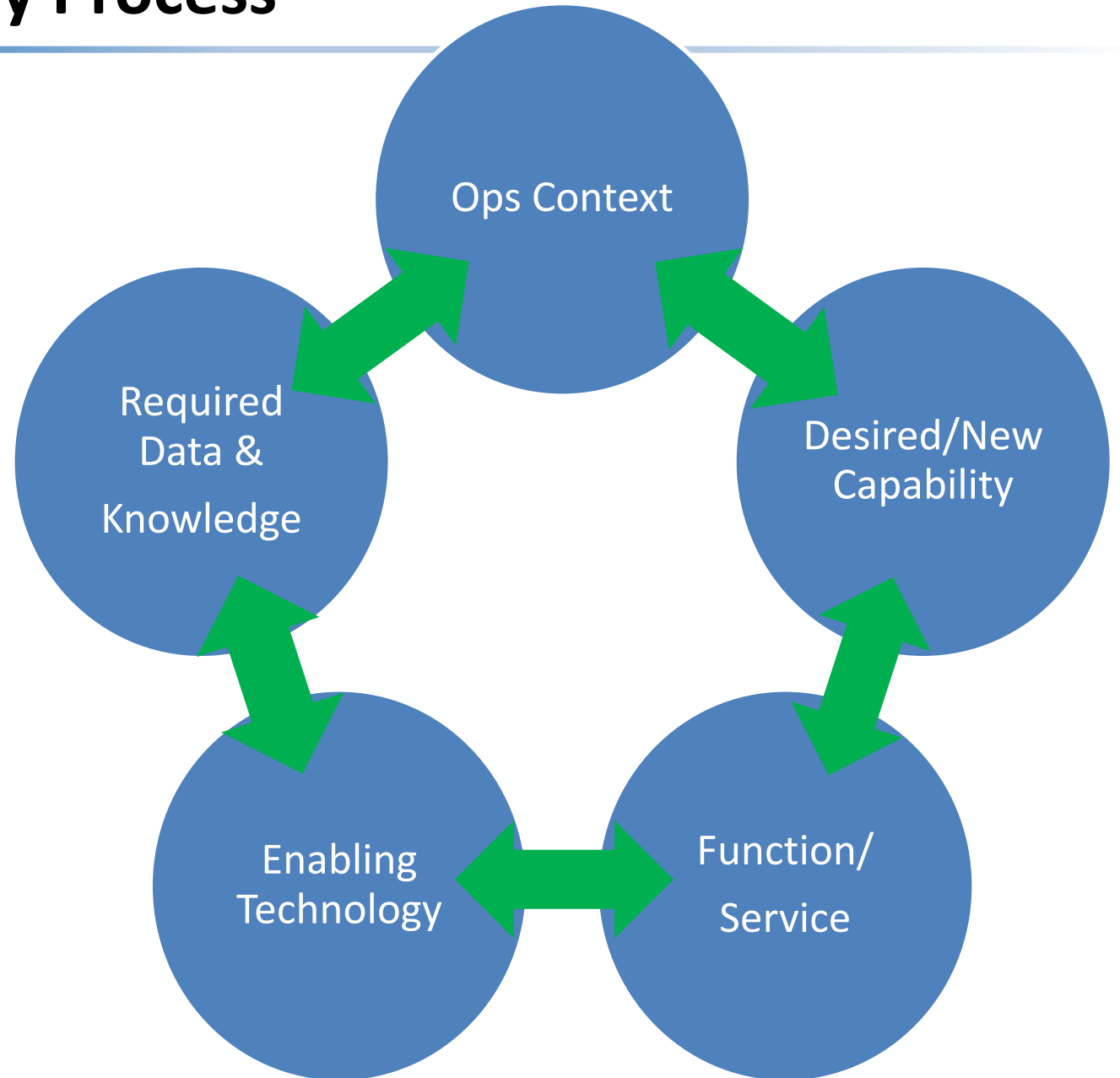- Function/Service – Task, Role, and/or Intent of a System to Enable a Capability
- Technology – Equipment & Elements to Implement a Function/Service
- Data/Sensors – Information Sources Required by a Technology to Achieve and Maintain its Function in Support of a Capability
- Cannot Reach a Capability without assessing maturity, integrity, reliability, availability, etc. of data sources & technology to implement an intended function in support of a new capability
  - Must have a clear maturation path from data/sensors, to core technology, to intended function, to mature capability for civil use in specific context

Applied Capability Maturity Process

- Identify Specific Ops Context
- Define Desired, New Capability
- Evaluate Functions/Services Required to Enable the Capability in Intended Ops Context
- Determine What Technologies Already Enable the Functions Needed, or Could Evolve to Provide the Function
- Evaluate Technology to Determine Required Data (System) & Knowledge (for Human Involved)
- Determine If Maturity Can Be Expanded for New, More Complex Ops Context

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Defining YOUR Epoch – What Does Success Look Like?

CONOP & Use Cases

Lessons, Scalability, Enablers, & Barriers

Ops Integration

Regs/Standards

Technology Maturity

Greater Operational Integration & Risk of Use

Growing Capability Maturity
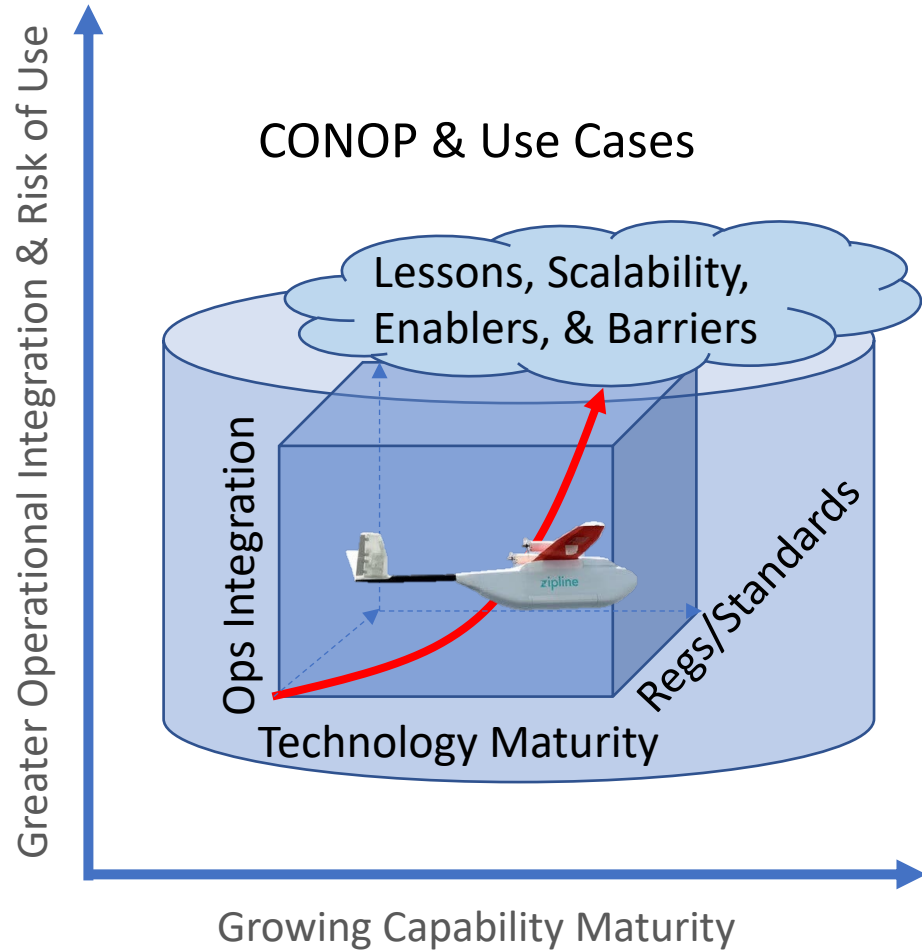
- Define "Success" Within Your Epoch – What Does Fully Developed Vision Look Like?
  - Level of Operational Integration & Airspace
  - Technological Maturity – Prototype or Operationally Proven?
  - Regulatory Maturity – What Rules Apply or are Excluded by Ops Limits?
- What Lessons Learned, Enablers, Barriers Might Be Scalable to Other Use Cases – Common Ground?

Roadmap for Future Should Connect Functional Epochs

Consider Technical & Regulatory Maturity + Aircraft/Ops

AAM M:N CONOP

Lessons, Scalability, Enablers, & Barriers

Larger AAM M:N CONOP

Lessons, Scalability, Enablers, & Barriers

SUAS M:N CONOP Today

Lessons, Scalability, Enablers, & Barriers

Ops Integration

Regs/Standards

Technology Maturity

Greater Operational Integration & Risk of Use

Enabler

Barrier or R&D Opportunity

Capability

GAPS?

Epoch 1

Epoch 2
Growing Capability Maturity

Epoch 3

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